

**What is claimed is:**

1. A catalyst composition represented by:

$\text{Ni}_x\text{Mg}_y\text{O}$ , wherein x and y represent the molar amounts of Ni and Mg respectively, and wherein: the Ni to Mg molar ratio is from about 1 to 1 to about 6.2 to 1, the percentage of Ni in the metallic state is from about 15% to 95%, and the percentage of Ni in the active state is greater than 25%, based on the total number of metallic Ni sites.

2. The catalyst composition of claim 1 wherein the molar ratio of Ni to Mg is from about 1.8 to 1 to about 2.8 to 1.

3. The catalyst composition of claim 1 wherein the molar ratio of Ni to Mg is from about 2.0 to 1 to about 2.8 to 1.

4. The catalyst composition of claim 1 wherein the percentage of Ni in the metallic state is from about 55% to 80%.

5. The catalyst composition of claim 4 wherein the percentage of Ni in the metallic state is from about 65% to 75%.

6. A catalyst composition represented by:

$\text{Ni}_x\text{Mg}_y\text{Cu}_z\text{O}$ , wherein x, y, and z are the molar amounts of Ni, Mg, and Cu respectively, and wherein: the molar ratio of Ni to Cu is about 19 to 1 to about 1 to 1; a molar ratio of Ni to Mg of about 1.3 to 1 to about 3.6 to 1; the percentage of Ni and Cu in the metallic state is from about 15% to about 95%, and the percentage of Ni, of the metallic sites, in the active state is greater than 25%.

7. The catalyst composition of claim 6 wherein the molar ratio of Ni to Cu is from about 9 to 1 to about 7 to 3.

8. The catalyst composition of claim 7 wherein the molar ratio of Ni to Cu is about 4 to 1.

9. The catalyst composition of claim 7 wherein the molar ratio of Ni to Mg is from about 1.8 to 1 to 2.8 to 1.

10. The catalyst composition of claim 9 wherein the molar ratio of Ni to Mg is from about 2.0 to 1 to about 2.8 to 1.
11. The catalyst composition of claim 8 wherein the molar ratio of Ni to Mg is from about 2.0 to 1 to about 2.8 to 1.
12. The catalyst of claim 6 wherein the percentage of Ni and Cu in the metallic state is from about 50% to 90%.
13. The catalyst of claim 12 wherein the percentage of Ni and Cu in the metallic state is from about 70% to 85%.
14. A method for preparing a catalyst composition represented by  $\text{Ni}_x\text{Mg}_y\text{O}$ , wherein x and y represent the molar amounts of Ni and Mg; and wherein; the Ni to Mg molar ratio is from about 1.3 to about 3.6; the percentage of Ni in the metallic state is from about 15% to about 95%, and the percentage of Ni in the active state is greater than about 25%, which method comprises:
- a) dissolving a Ni-salt in an effective amount of solvent in which the Ni-salt is substantially soluble, thereby resulting in a Ni-salt solvent solution;
  - b) adding an effective amount of a Mg-containing compound to form a slurry with the Ni-salt solvent solution;
  - c) driving off an amount of solvent to form a paste comprised of the Ni-salt, Mg-containing compound, and solvent;
  - d) drying said paste to form a powder comprised of said Ni-salt and Mg-containing compound;
  - e) calcining said powder at a temperature from about 350° to 1000°C, which temperature is effective to decompose the Ni-salt, but not to vaporize Ni;
  - f) grinding said calcined powder to a finely divided state; and
  - g) subjecting said finely divided powder to a reducing environment at a temperature from about 500°C to about 1200 °C for an effective amount of time to form a final catalyst.
15. The method of claim 14 wherein the solvent is water.
16. The method of claim 14 wherein the Ni salt is selected from the group consisting of nickel nitrate, nickel chloride, nickel sulfate, nickel acetate, and nickel carbonate.

17. The method of claim 16 wherein the Ni salt is nickel nitrate.
18. The method of claim 14 wherein the magnesium-containing compound is selected from the group consisting of magnesium oxide, magnesium hydroxide, magnesium carbonate, magnesium nitrate, magnesium acetate, magnesium sulfate, and magnesium chloride.
19. The method of claim 16 wherein the magnesium compound is magnesium oxide.
20. The method of claim 14 wherein the percentage of Ni in the metallic state is from about 65% to 75%.